Program Overview

Precision and Gun-Launched Fire Support
at the
Precision Strike Conference
21 April 2004

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PM CAS: Mission and Vision

MISSION

Perform Life-Cycle Management of Tube-Launched Indirect Fire Munitions, Mortar Weapons, and Mortar Fire-Control Systems

VISION

Deliver Conventional and Leap-Ahead Munitions Combat Power to Warfighters, Giving them the Materiel Edge over Potential Adversaries

PM CAS Management Imperatives

- Meet Requirements and Pursue Promising Technologies
- Promote Competition to achieve Best Value and Drive Down Costs
- Leverage Investments and Reinforce Successful Partnerships
- Endorse Teamwork and Employee Empowerment
- Promote and Employ Disciplined Processes
- Promote Lean Design and Production
- Promote Commonality and Interoperability
- Plan Aggressive and Non-Traditional T&E
- Take Calculated Risks, but Manage and Mitigate them
- Employ Spiral Development and Continuous Process Improvement
- Leverage Information Technology and Knowledge Management Systems
- “Trust, but Verify” – ‘Put Eyeballs On’ to Maximize Situational Awareness

PM CAS Organization

PM Combat Ammunition Systems

PM, COL Nathaniel Sledge, Jr. 973 724-2003

DPM, Mr. Rene Kiebler 973 724-2110

Excalibur
PM, LTC Jeff Wilson
DPM, Mr. Chris Grassano
973 724-3152

Mortar Systems
PM, LTC Andre Kirnes
DPM, Mr. David Super
973 724-4209

Precision Effects
Mr. Peter Burke
973 724-5802

Weapons and Fire Control
Mr. Ed Lewis
973 724-4995

Business Management
Mr. Joseph Gormley
973 724-5891

Over 300 People!

Conventional Ammunition
Mr. Armando Herrera
973 724-3636

US Army Joint Munitions Command
Mrs. Celia Hadden
DSN 793-6491

Artillery
Mr. Martin Moratz
973 724-5247

Mortars
Mr. John Slivovsky
973 724-3665

Advanced Systems
Mr. Steven Hromnak
973 724-5476

Energetics
Mr. Jim Rutkowski
973 724-2394

OPM CAS
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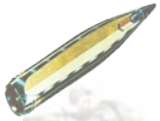
Army Transformation: How We Fit In

155mm
M795 HE

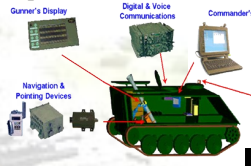


M782 **MOFA**

155mm **MACS**

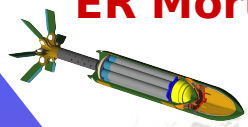
155mm
M864 Recap

MFCS



ACAAP

120mm XM984 ER Mortar



81mm LW Mortar

105mm
M915 **DPICM**

Special Operations

Modernized CATK

Stryker Force

Forced Entry

- **Agile**
- **Lethal**
- **Versatile**
- **Survivable**
- **Deployable**
- **Responsive**
- **Sustainable**

Future Force

CCF

155mm
M107 HE

155mm
Less-Lethal

2004

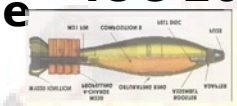
IOC 2010

FOC 2012

60mm Mortar Family
- High Explosive
- Smoke
- Illuminating
- Full Range PC

81mm Mortar Family
High Explosive
Smoke
Illuminating
Full Range PC

M1155 PIAFS



120mm Mortar Family
- High Explosive
- Smoke
- Illuminating
- Full Range PC

SFM

Excalibur
- **Unitary**
- **Discriminating**

PGMM

Precision/Near Precision/System Support

Indirect Fires Investment Strategy (POM 06-11)

Terms of Reference

- Improve precision and deployability
- Accelerate technology to Current Force
- Better balance investment between Current and Future Forces

Greatest ROI

75%

Future Force

Bridge to Future Force

25%

Curren t Force

Paladi

Mortars

Stryker Force

LW155

Networked	Responsive
Joint	Continuous
Mobile	Survivable
Lethal	Precise
Sustainable	Full Spectrum

The Basis for Fire Support Guidance Strategy

Guidance

- National Military Strategy (NCA)
- Joint Vision 2020 (Joint Staff)
- Total Army Plan (15 Years) (DA)
- Army Transformation Plan

Studies

- FCS Analysis of Alternatives (TRADOC)
- PGMM Analysis of Alternatives (TRADOC)
- FCS Lethality Effectiveness Study
- Course-Correcting Fuze Study (USFAS)

Plans and Concepts

- Army Indirect Fires Strategy (TRADOC)
- FCS Organizational and Operational Plan (TRADOC)
- Unit of Action Organizational and Operational Plan (TRADOC)
- Fires and Effects Concept (USFAS)
- FCS ORD (TRADOC)

Observations

- OEF/OIF Observations (31D, 101st, 10th MNT, Rangers)
- Trends in Rules of Engagement (ROE), Technology, Doctrine, TTP, and Threat (Multiple)
- Known Capability Gaps (TRAC)
- USAWC Study on Operations in Afghanistan (S. Biddle)

Transforming Army Indirect Fires

Networked through Battle Command

Fully Interoperable with Joint systems

Mobile (Strategic and Tactical)

Responsive & Integrated with Maneuver

Lethal (through precision and e)

Precise Effects with Area s

Challenges

Strategic Deployability
Networked Capability (C4)
Tactical Mobility
Target Location (ISR)
Accuracy / Rate of Fire
Precision Munitions
Discriminating Munitions

To achieve **Destructive, Suppressive** and **Protective** effects while **minimizing collateral damage**

taking advantage of **emerging technology**

Army's Direction for Precision

- **DPG (FY 04-09) :** "Smart Artillery Rounds: The Department of the Army will accelerate the Excalibur GPS guided round program."
- **Army Modernization Plan (2003):** "At the tactical level, we rely on immediately responsive, continuously available, organic fires to enable our units to maneuver."
- **Army Report on Indirect Fires (25 July 2002):** "The Army fully supports OSD proposals to accelerate Army precision fire initiatives… such as Excalibur by FY07."
- **Unit of Action O&O:** Precision fires… "allow small units in the UA to selectively destroy key enemy systems and forces."
- **FCS KPP #3:** "the UA must have the ability to create lethal and non-lethal overmatch at the time and place of its choosing. The FCS FoS must be capable of employing networked LOS, BLOS and NLOS capabilities fully integrated with maneuver to suppress and destroy enemy forces and systems with greater precision, at extended ranges and in close combat."
- **SECDEF Lessons Learned from OIF:** **"**Key lessons so far include the importance of precision & the ability to deliver devastating damage to enemy positions, while sparing civilian lives & the civilian infrastructure."

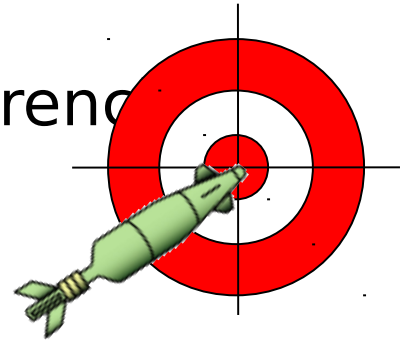
Need for Greater Precision and Range

FCS ORD

- The NLOS Cannon provides networked, extended–range fires for **precision attack** of point and **area** targets in support of the US with a suite of munitions that include special purpose capabilities. [Para 1.5.2.5.8.2. FCS ORD]
- FCS NLOS Cannon must be capable of firing **current** ammunition with a total Circular Error Probable (CEP) (including bias and precision error) that does not exceed 0.55% of range at low angle, for **ranges of 30 kilometers or less**. [Para 2.0.4.1.5 FCS ORD, 2172] (i.e. CEP ≤ 165 meters @ 30 km)
- The FCS FoS must be capable of Joint networked lethal and non-lethal effects that achieve overmatch – out of contact, **at tactical standoff and in close combat** to defeat the target sets detailed in Chapter 4 of the FCS STAR. [Para 1.5.2.5.5. FCS ORD]
- The OF will exploit the effects of **precision long range fires** to close with and destroy the enemy [Para 1.2.1.1 FCS ORD]
- … the UA employs destructive fires with **great precision at extended ranges** against high payoff targets…the increased long-range killing capability of fires will be employed to fix and destroy the enemy…fires ensure freedom of action and maneuver.. [Para 1.5.2.5.5 FCS ORD]
- FCS NLOS Cannon must be capable of firing munitions at least **30 km** (Threshold) / 40 km (Objective) [Para 2.0.4.1.4 FCS ORD 2169]

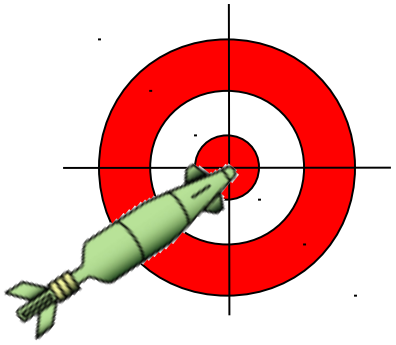
Doctrinal Basis for Precision

- Expands mission set to include **urban operations**
- Addresses concerns about **collateral damage**
- Provides **Stand-off precision** engagement to fix enemy formations and to set the conditions
- Facilitates engagement of **High-Payoff Targets** (HPTs), especially before forces are joined
- Enhances **transition to “danger close”** operations
- Presents “**move or die” dilemma** to entrenc enemy

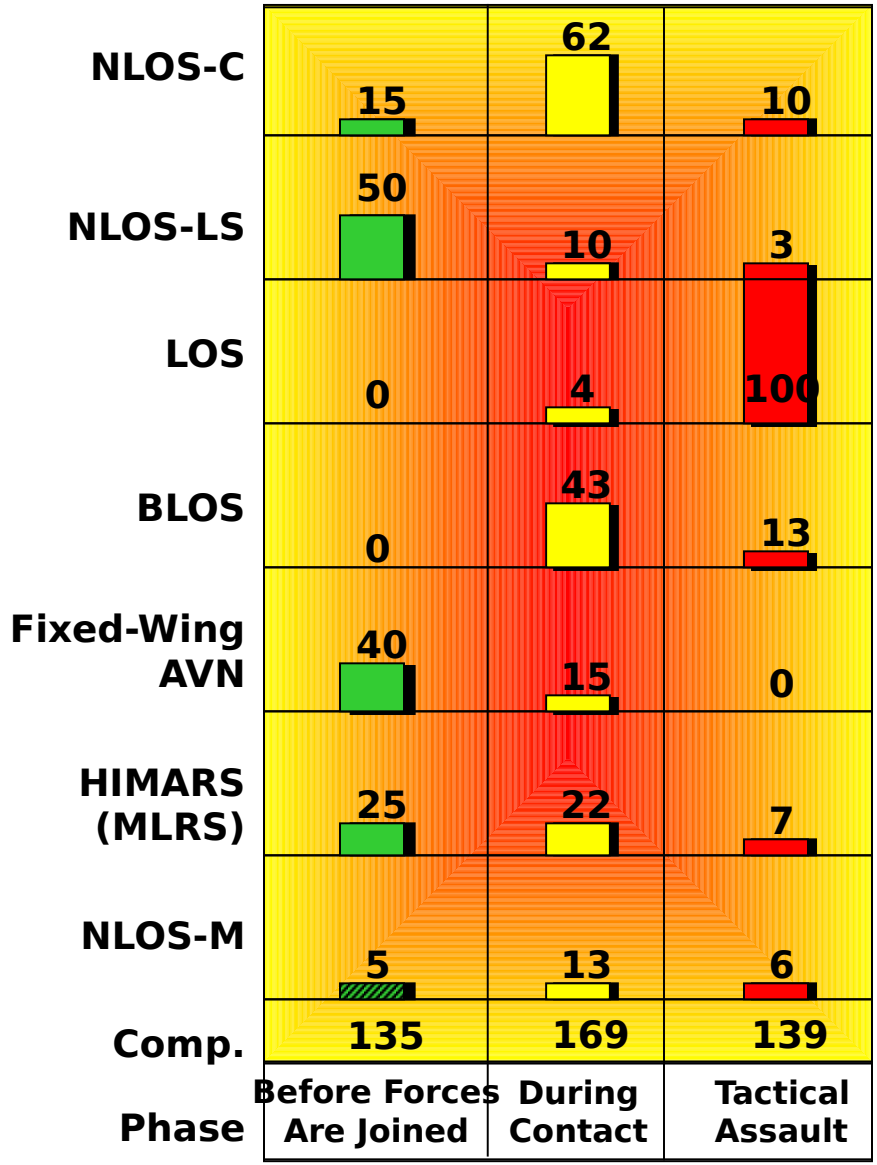


Doctrinal Basis for Precision

- **Shapes the fight** through destruction of HPTs and centers of gravity
- **Makes fire missions quicker**, enabling increased OPTEMPO through rapid destruction of HPTs and MDTs
- Reduces dependence on and **frequency of ammunition resupply** because of increased efficiency and lethality
- Enhances close support through **reduction in danger close distance**



NLOS Mix Study Results (2003) (Relative Participation by Battle Phase)



Findings and Conclusions:

- Analysis shows **need for mix of organic NLOS capabilities** (mortar, cannon, missile) that optimize the UA for responsive fires.
- Range of missions demands robust set of organic fires and effects capabilities. These **spectrums of capabilities are necessary** across and within the realms of mortars, artillery, rockets, and missiles.
- **Setting the conditions at stand-off** is key to conducting decisive operations at friendly time and place of choosing.
- UA **must have extended range, precision artillery fires** to begin the attack of HPTs and **precision mortars and volumetric artillery fires** to engage MDTs while conducting precision maneuver to its position(s) of advantage.
- **Very responsive suppressive fires are required** because an adaptive enemy cannot always be targeted, even with an extensive array of layered sensors.
- Very responsive fire support systems, Networked Battle Command, and execution-oriented targeting processes enable **dynamic target attack and unprecedented responsiveness** to all echelons of the future Force.
- Reach to UE and joint fires provides critical

Not in Study

Summary of Army Studies

Findings

- **A robust mix of fire support systems** is required to address the **full spectrum** of requirements, to maintain **Agility and Flexibility**, and to mitigate against surprise
- **Complementary systems** increase flexibility and provide scalable effects
- **Lethality, Volume, Precision, Responsiveness** (24/7, all weather, all terrain), and **Range** remain critical attributes of a fire support system
- **Networked, Massed, and Precision** fires offer opportunity to disrupt/destroy enemy capabilities at greater depths and with greater precision

Ongoing Efforts

- **Determining the best mix of joint fires** to meet Objective Force fire support requirements
- **Continuing experimentation and analysis** through modeling and simulation and army, joint, and multinational exercises

Mortars Feedback from Operations Enduring Freedom and Iraqi Freedom

- Mortars were very effective - The **primary organic killer**
- Mortars were **most responsive and most integrated** means of providing close fire support
- **Dispersed but lethal enemy requires more precise fires**
- Mortars **proficient at "hip shoots"** and at destroying RPG teams in urban environment
- With spotty re-supply, **high number of rounds per point target mission** presented serious deficiencies in effectiveness and endurance (e.g., Required 16 rounds to engage enemy bunkers)
- 120mm increased light force lethality - **Need Arms Room Concept** "We've got to get the ARC to all our Forced Entry forces" – LTG Cody, G3, USA

Cannon Feedback from Operation Iraqi Freedom

- Cannons **paved the way** during the historic advance to Baghdad
- Cannons were the **most responsive inorganic fire support asset** available for shaping and close fires
- Cannons **provided the majority of close support** to committed forces
- Majority of targets attacked at **maximum range**
- **Extended-range inefficiency** increased the logistics burden
- Cannon **DPICM barely used** because of concern about collateral damage, accuracy and duds
- **Copperhead not used** because of negative perceptions about ease of use
- **SADARM was the only smart artillery munition available:** Destroyed 48 pieces of equipment with 121 rounds

OIF Winners

- HEVT
- SFMs
- Mortars
- M7 BFIST
- CAS (A-10s)
- Paladin SPH
- Control Measures
- LRAS3 (Target Acquisition)

But materiel is useless without . . .

- Leadership
- Unit Cohesion
- Doctrine & TTP
- Innovation
- Adaptability

Observation Summary

- Ground Fire SPT was most **Responsive**, most **Available**, and most **Adaptive**
- Preferred munitions: HE(VT), SFMs, & Mortars
- **Suppression still required** for Most Dangerous Targets (MDTs) because we may never have perfect knowledge about the enemy
- **Extended Range** engagements provide greater standoff and improved force survivability
- **Greater Precision needed** to enable friendly forces to develop situations out of contact (High Payoff Targets (HPTs)) and to reduce the threat of MDTs
- Implication: Friendly Forces require a **robust mix of mortar and artillery capabilities**

Threat Trends

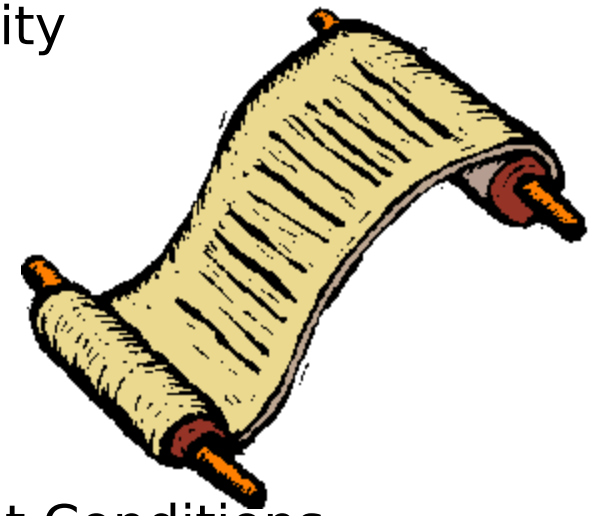
- Asymmetric/Paramilitary
- **Nonrestrictive Rules of Engagement**
- Seeks Cover in **Reinforced Structures** and Vehicles
- Operates Widely Dispersed on Nonlinear Battlefield
- **Interspersed with Noncombatants**
- **Seeks Sanctuary in Urban and Complex Terrain**
- Exploits Terrain and Geography
- Possesses Electronic Countermeasures

Trends in Rules of Engagement (ROE)

- **Minimize Collateral Damage to Protect . . .**
  - ✓ Noncombatants
  - ✓ Religious and Cultural Landmarks
  - ✓ Socio-Economic Infrastructure (METT-TC Context)
- **Minimize Unexploded Ordnance**
- **Conduct Less-Lethal Operations**
  - ✓ Transition to SASO
  - ✓ Scalable Fires and Effects

Trends in Doctrine and TTP

- Emphasis on strategic and operational mobility
- Network Centric Warfare (Fires and Effects)
- Dynamic Force Tailoring
- Primacy of C4ISR, Fire Direction and Control
- **Reduced Collateral Damage**
- **Expectation of More Efficient Fires**
- **Reduce Logistic/Footprint**
- **Need for Standoff Range** to Shape and Set Conditions
- Joint and Multinational Fires and Effects
- **Scalable Effects** (agile, flexible, versatile, and complementary)
- Greater Integration of Fires and Maneuver
- Capabilities Based Requirements
- **Proliferation of Targeting Devices** (Acquisition and Locating)
- **Use of Special Purpose Fires** (Non-lethal and unmanned ground sensors)



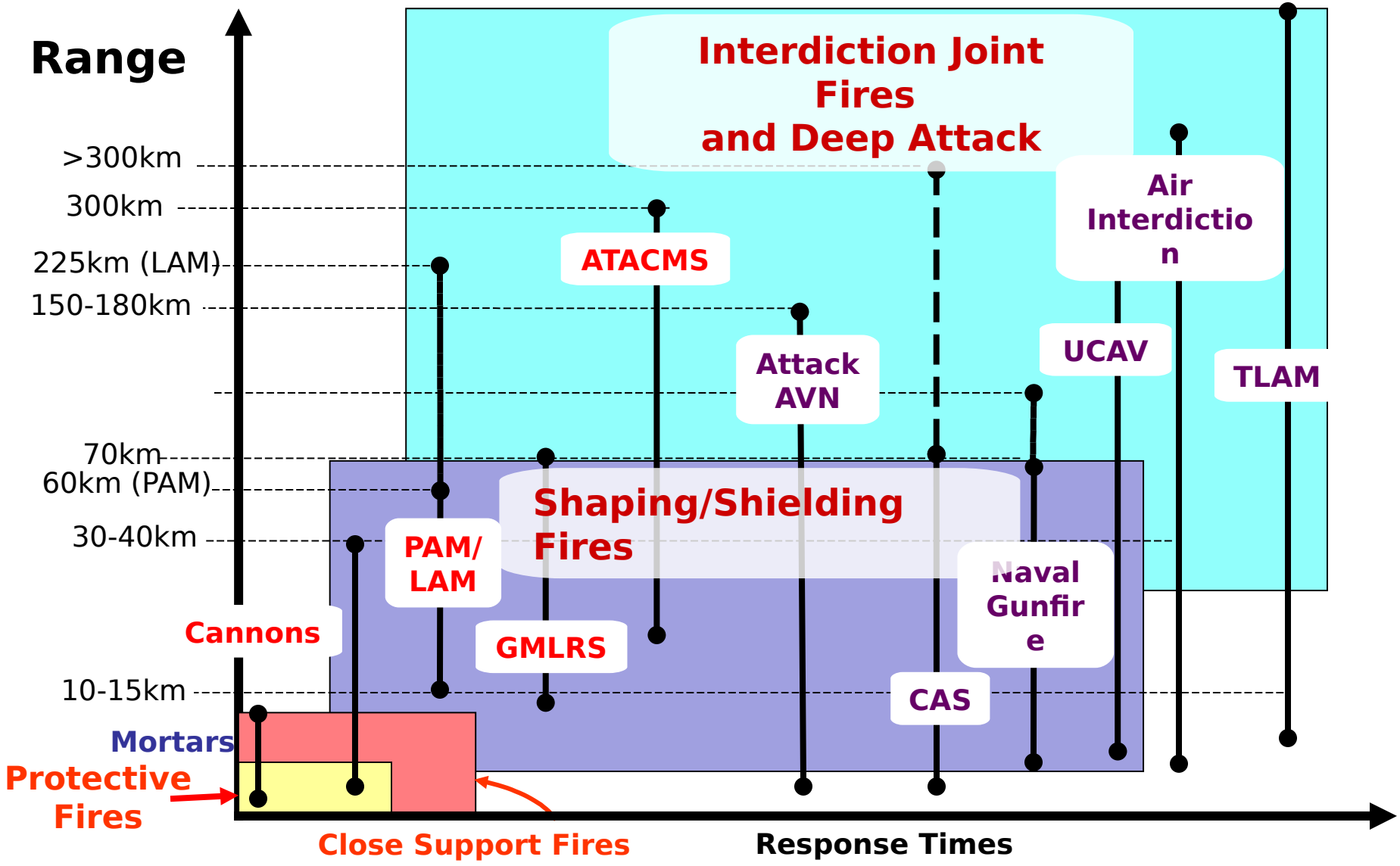
Trends in Technology

- **Miniaturization of processors** (deeply integrated guidance)
- **GPS/SASSM**
- **MEMS**
- Robotics
- Materials
- **Automation**
- Thermobarics
- **Power Sources**
- Non-/Less-Lethal
- Sensors (LADAR)
- Nanotechnologies/Energetics
- Improved software and algorithms
- Increased data storage and bandwidth

Joint PGM Assets

JASSM	Air Force,	500	GPS/IR	1000 LB HE	Standoff Area Defenses, ATA	*FY04*
	Navy					
SLAM ER	Navy	240	GPS/IR	700 LB HE	Standoff Area Defenses, MITL	FY00
JSOW-C	Air Force	150	GPS/IR	500 LB HE	Standoff Point Defenses, ATA	FY02
	Navy					
JDAM	Air Force,	25	GPS	500, 1000 &	Low Cost	FY97
	Navy			2000 LB HE		
Paveway	Air Force,	20	GPS/SAL	500, 1000,	Precision, MITL, Low Cost	FY76/FY83
	Navy			2000 LB HE		
HARM	Air Force,	150	ARH	140 LB B/F	High Speed, Suppression	FY84
	Navy					
JSOW-A	Air Force,	150	GPS	145 BLU-97	Standoff Point Defenses	FY98
	Navy					
ER TMD	Air Force	75	GPS/SAL	10 BLU-108	Multiple Kills Per Weapon	*FY08+*
JCM	Air Force,	28	GPS/IR/	10 &20LB SC	LOBL, LOAL, BLOS	*FY08+*
	Navy, Army		MMW/SAL			
ATACMS	Army	300	GPS	275-950 M74	Standoff	FY97
GMLRS	Army	70	GPS	404 M77	Guided Rocket	*FY06*
ERGM	Navy	50 miles	GPS	24 LB B/F	Vertical Impact. Very Low Collatera	*FY06*
					Damage, Low Cost, Fire Power	
Excalibur	Army	40	GPS	63 LB B/F	Vertical Impact. Very Low Collatera	*FY06/ FY08*
					Damage, Low Cost, Fire Power	
PGMM	Army	7	SAL	17 LB B/F	Precision, Low Cost	*FY10*
PAM/LAM	Army	15 to 280	SAL+	10 & 23 LB	Stand off ranges, vertical Impact,	
				HE/SC	Very Low Collateral Damage	*FY10*

Mix of Joint Fire Capabilities



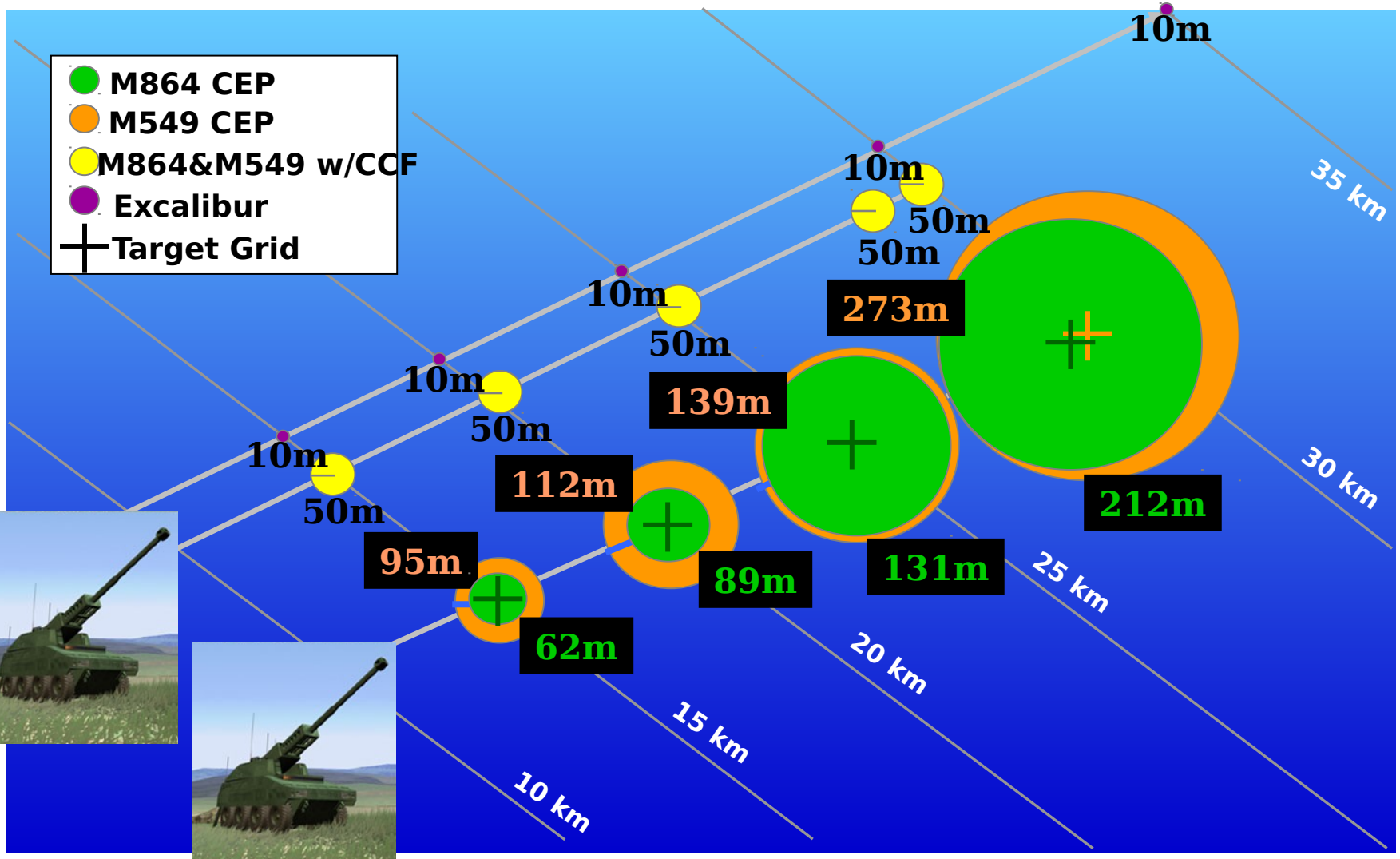
Field Artillery Precision Assets

Munitioins		Min Range	Max Range	Warhead	Precision
ATACMS		25km	300km	275 to 950 M74	≈15m
GMLRS		15km	73.5km	404 M77	15m
Excalibur (Block I)		8km	40km	HE, Blast/Frag	10m
Course Correction Fuze	M549A1	6km	30	HE	50m
	M864	5km	28	DPICM	
Copperhead		5.2km	16km	HE, Composite-B	1m
PGMM		1km	7.2km	HE Blast/Frag	1m
LAM		15km	280km	HE, Blast/Frag	0.5m
PAM		20km	60km	HE, SC/Frag	0.5
SFMs		3.5km	28km	Sensor Fuze Munition	N/A

Fielded
In Development
Exploration/Tech Demo

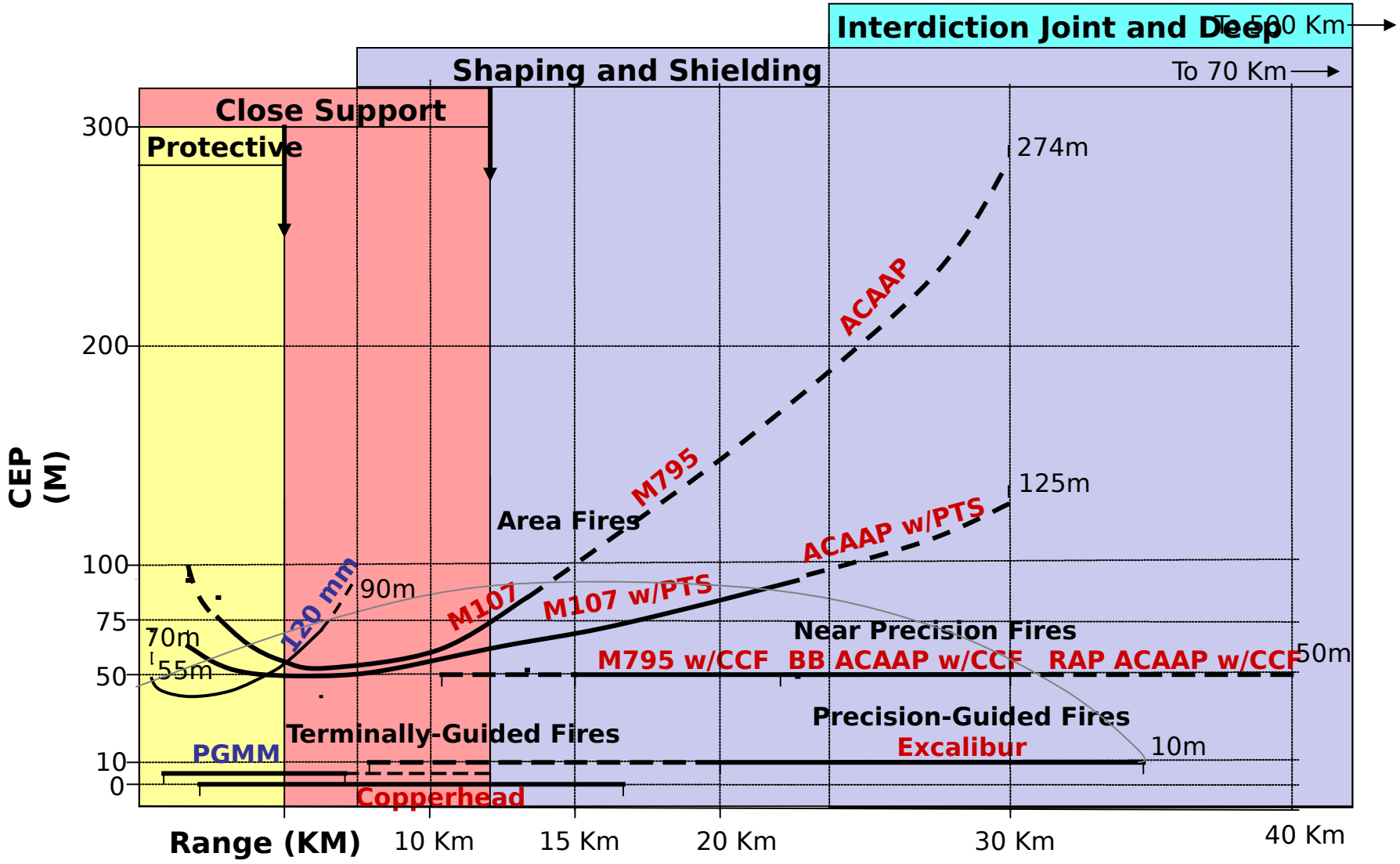
Note:
TLE=0m

Field Artillery Scalable Precision



Source: AMSAA data for unccorrected M864 &

Precision Versus Range (155mm Cannons and 120mm Mortars)

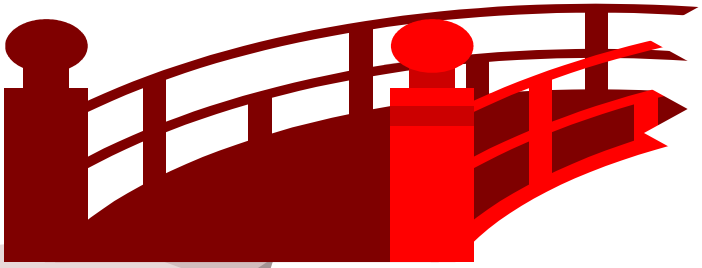


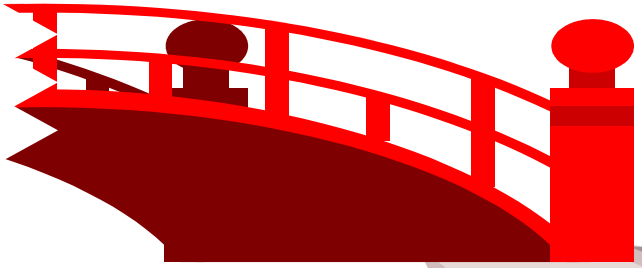
Munitions Characteristics Matrix (Relative Performance Scale)

Characteristics Munitions	Wt.	Excalibur	PGMM	CCF HE	155 HE	120 HE
Precision	5	2	1	3	5	4
Accuracy	4	2	1	3	3	3
Effective Unit Lethality	4	1	1	2	3	3
Collateral Damage	4	2	1	4	5	5
Mission Breadth	3	1	3	2	3	4
Range (max)	5	1	3	2	2	4
Range (min)	3	4	2	4	3	1
Danger Close	5	3	1	3	5	3
Environmental Sensitivity	4	1	3	2	3	3
Susceptibility to CM	3	3	3	2	1	1
Operational Ease	3	1	3	1	2	2
Integration with Maneuver	2	2	1	2	2	1
Composite		1.9	1.9	2.5	3.2	2.8

LEGEND: Best 1 2 3 4 5 Worst

Capability Gaps and Needs





Current Force

- **Precision**
  - ✓ Collateral Damage
  - ✓ Urban Operations
- **Accuracy**
- **Range**
- Sustainability
- Safety
- Readiness and Training
- Responsiveness
- Cost Effectiveness

Future Force

- **Lethality**
- **Operational Efficiency**
- **Robustness**
- Special Purpose
  - ✓ Weather
  - ✓ Complex Terrain
  - ✓ Scalable Effects
- Mobility
- Automation

Capability Gap Matrix

Products and Initiatives	Precision/ Collateral Damage	Range	Safety	Responsive	Accuracy	Auto	Effective Lethality	Robust	SPCL Purpose	Sustain	Cost Effect	Mobility	Readiness Training
Excalibur	✓	✓	✓	✓			✓	✓		✓	✓		
PGMM	✓	✓	✓		✓		✓	✓		✓	✓		
CCF	✓	✓	✓		✓		✓	✓		✓	✓		
MFCS	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
ACA^{2}P		✓	✓	✓			✓	✓	✓		✓		
SFM			✓		✓		✓	✓			✓		
ER Mortar	✓	✓			✓			✓					
M864 w/ eSDF			✓				✓	✓					
M915 w/ eSDF			✓					✓					
60mm MAPAM							✓	✓	✓	✓	✓		
ARC							✓	✓					
MACS		✓	✓			✓		✓		✓			✓
Lt. Wt. Mortar								✓				✓	
EPIAFS	✓		✓	✓	✓	✓		✓	✓				
TGT Acq./TGT Loc				✓	✓	✓	✓	✓	✓		✓		
Lean Acq/Sprial											✓		
NLOS-C	✓		✓	✓	✓	✓	✓	✓				✓	
NLOS-M	✓		✓	✓	✓	✓	✓	✓				✓	
81mm Insert										✓	✓		✓
Less-Lethal			✓						✓		✓		
Thermobaric							✓		✓		✓		
CAP										✓	✓		✓
RFID				✓		✓				✓	✓		
120mm Breach Cap			✓										✓

Bridging the Gaps

Sustainability
- Excalibur
- PGMM
- CCF
- MACS
- Lt. Wt. Mortar

Range
- Excalibur
- ACAAP
- PGMM
- ER Mortar
- Arms Room Concept

Training/Readiness
- CAP
- MACS
- 81mm Insert

Precision
- Excalibur
- PGMM
- CCF
- MFCS
- PTS

Safety
- eSDF
- 120mm Breech CAP

Special Purpose
- Cargo
- HPM
- Less-Lethal
- Obscurants
- Illumination
- Thermobaric

Responsiveness
- MFCS
- EPIAFS & MOFA
- NLOS-C & NLOS-M
- Fires Network

Mobility
- Lt. Wt. Mortar
- NLOS-M
- NLOS-C
- Stowed Kills

Automation
- Ammo Handling
- Fire Control
- Fuze Setters
- Modular Charges
- Inventory Management
- Dynamic Target Attack
- Target Deconfliction
- Target Acquisition
- Sensor Fusion

Robustness
- Spectrum of Capabilities
- Complementary Munitions Mix
- 24/7
- All Weather (Profiler)
- All Terrain (NLOS-M, NLOS-C)

Accuracy
- MFCS
- PGMM
- ATR Excalibur
- NLOS-C with PTS
- Target Designation Initiatives
- Sheafing Techniques
- Sensor Fused Munitions

Cost Effectiveness
- NPMs, PGMs, TGMs, & SFMs
- ACAAP and MFCS
- Lean Acquisition
- Spiral Development
- Modular Charges

Lethality
- Increased Rates of Fire & MRSI
- Angle of Incidence (Excalibur)
- Novel Warheads (ACAAP, PGMM, & 60mm MAPAM)
- eSDF
- SFMs
- TGMs, (PGMM, Copperhead)
- Arms Room Concept

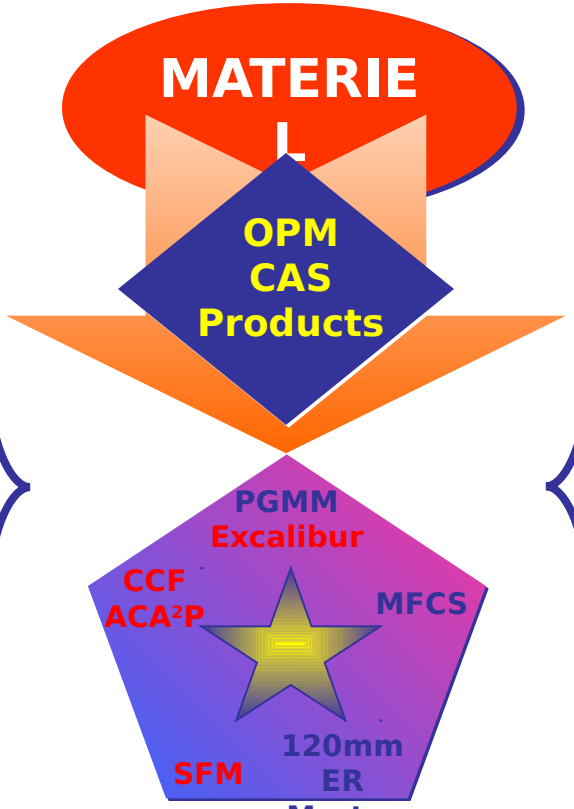
Fires Transformation: Precision - Accuracy - Range

Ends

Why? What?

- Speed Defeat of Enemy Thru Quicker Engagements
- Achieve Capability Overmatch
- Set Conditions and Shape the Battle:
  - ✓ Strike Deeply with Precision
  - ✓ Extend Range of Conventional Artillery
  - ✓ Facilitate the Close Fight
  - ✓ Enhance Force Survivability
  - ✓ Destroy HPTs and MDTs
- Improve Mission Effectiveness
  - ✓ Enhance Unit Lethality
  - ✓ Kill More with Less
  - ✓ Improve Prob. (Kill / Acquisition)
- Complement Other Munitions to increase Flexibility and Scalability
- Increase Robustness
  - ✓ Flexibility
  - ✓ Scalability
  - ✓ Adaptability
  - ✓ Hard Targets
  - ✓ Moving Targets
  - ✓ Complementary Effects
  - ✓ Danger-Close Operations
  - ✓ Expand Mission set to MOUT
  - ✓ Operate in Varied and Complex Terrain
- Reduce Fratricide
- Address Trends in . . .
  - ✓ Technology
  - ✓ Doctrine and TTP
  - ✓ ROE – Collateral Damage
  - ✓ Threat – Entrenched and Interspersed in Structures
- Reduce Logistics Burden:
  - ✓ Improve Accuracy
  - ✓ Improve Efficiency
  - ✓ Free Up Lift Assets
  - ✓ Increase Stowed Kills
  - ✓ Reduce Number of Platforms
  - ✓ Reduce Frequency of Resupply

Means



Interoperability

- Fire Support Network
- Logistics System
- Joint Fires
- NLOS-M
- NLOS-C
- Paladin
- LW155
- UAVs
- PTS

Other Systems

- NLOS-LS
- ATACMS
- HIMARS
- APKWS
- GMLRS
- MLRS
- BLOS
- JCM
- LAM
- PAM
- LOS
- FWA

Ways

How?

1. Improve Precision
2. Improve Accuracy
3. Improve Range

- Improve Mobility for Hi OPTEMPO
- Increase and Improve Automation
- Improve Rates of Fire
- Improve Fire Control and SoLns
- Employ Automated Asset Tracking
- Employ Target Mensuration & Sheafing Techniques
- Deeply Integrate Guidance, Navigation and Control
- Develop New Seekers (LADAR)
- Address Target Location Error:
  - ✓ Improve Target Acquisition & Locating Devices
  - ✓ Increase Density of Target Location Devices
- Assess Complementary Nature of Weapons
- Emphasize 5 Predictive Elements of Accurate Fire
- Interoperate with Joint Platforms, Networks, and Sensors
- Acquire Extended Range Artillery
- Address DOTLM-PF
  - ✓ Joint Effects Integration
  - ✓ Universal Observer
  - ✓ RSTA & FIST - Equip & TTPs

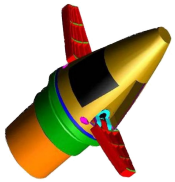
Highest Priority Development Programs

Precision
Accuracy
Range
Lethality
Robustness

Course Correcting Fuze

System Description:
A NATO-size fuze that provides ballistic course correction for spin stabilized artillery projectiles

Requirements:
Low cost, fuze-sized module resulting in projectile CEP <50M at max range



Goal: Near Precision
IC: FY07 **IOC:** FY10
Status: Developing co-operative program with Navy

POC: Mr. Russ Hill

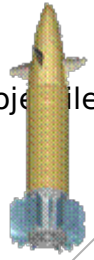
Excalibur

System Description:
Precision Guided, Extended Range 155mm projectile

Requirements:
Greatly increased precision and reduced collateral damage

Goal: Precision, Range **ACAT**: I
IC: FY06 (LW155) **IOC:** FY08
Status: SDD

POC: LTC Jeffrey Wilson



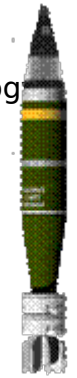
Precision Guided Mortar Munition

System Description:
Precision strike round with extended range and enhanced lethal mechanism technology

Requirements:
Capability to hit point targets

Goal: Range, Lethality, Accuracy
ACAT: II
IOC: FY10
Status: SDD contract award scheduled 3QFY04, following JROC approval.

POC: Mr. Pete Burke



Mortar Fire Control System

System Description: Links mortar fires with the digital battlefield

Requirements: Allow mortar crews to send and receive digital call for fire messages

Goal: Accuracy, Responsiveness
IOC: FY03

Status: Fielding

POC: MAJ James Winbush

120mm ER Mortar

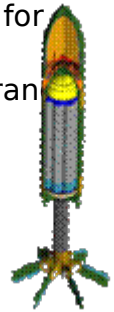
System Description:
ER-DPICM round made with lightweight composites round and rocket motor for increased range

Requirements: 50% greater ran

Goal: Range, Lethality

IOC: FY11

Status: STO UFR **POC:** Mr. Pete Burke



Sensor Fuzed Munitions

System Description:
Autonomous, fire and forget, all weather 155mm SFW projectile

Requirements: Destroy or Immobilize stationary SPHs and other hard point targets

Goal: Lethality
IOC: N/A **Status:** Accessing foreign NDI projectile compliance with JBMOU **POC:** Mr. Russ Hill

Advanced Cannon Artillery Ammunition Program

System Description: Extended range NDI projectiles

Requirements:
Increased Lethality through Pff technology

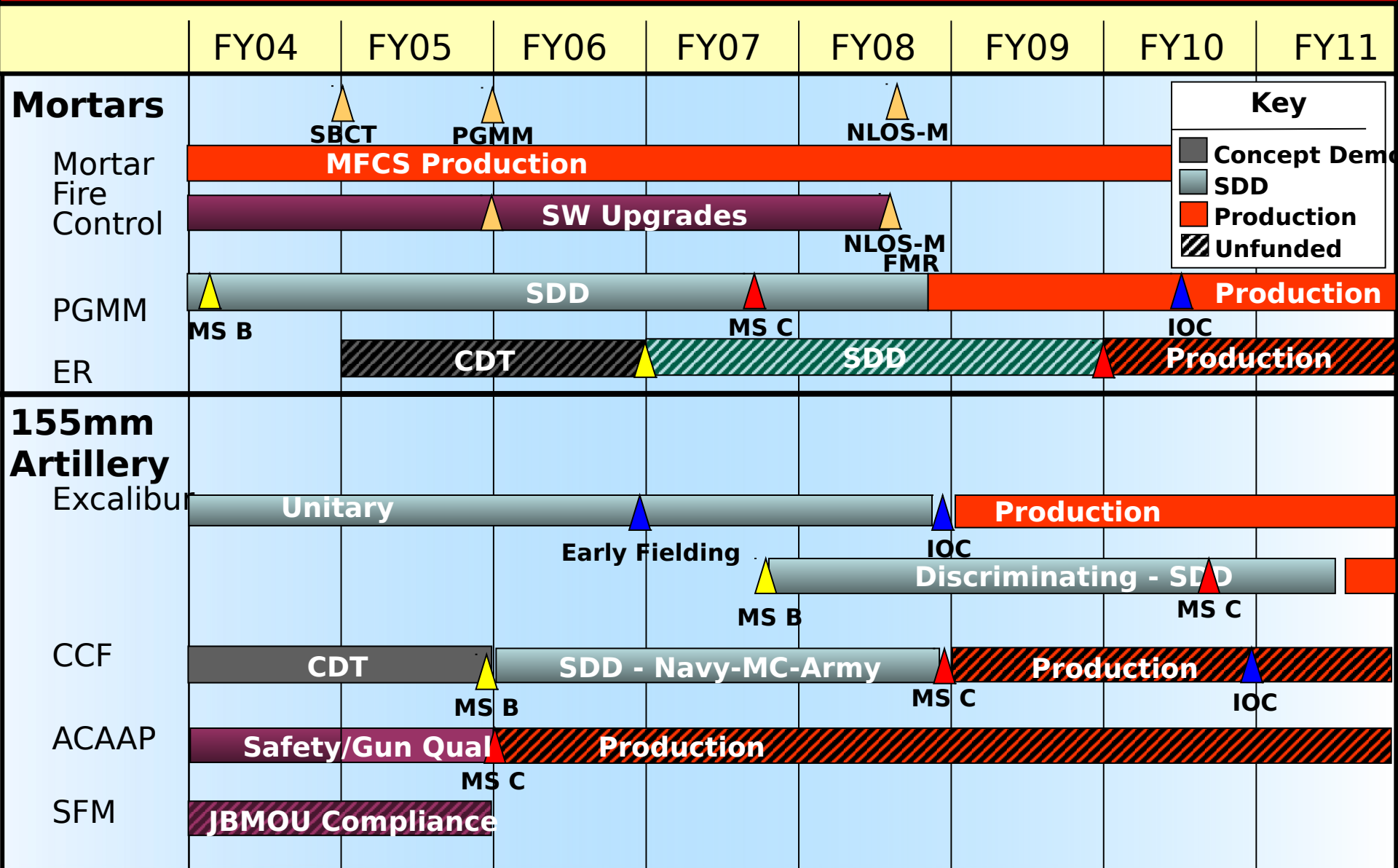
Goal: Range, Ballistic Similitude

IOC: FY06

Status: Safety Testing

POC: Mr. John Irizarry

Roadmap for Top Programs



2004 Precision-Related Objectives

- Conduct Successful Excalibur Guided-Gunfire-A Test Series
- Award and Kickoff the PGMM SDD contract
- Manage the cooperative CCF/GIF program with the Navy. (Secure Additional Funding)
- Secure additional funding for the ACA^{2}P
- Secure S&T funding for the 120mm XM984 Extended-Range, Field MFCS Cargo-Carrying mortar
- Kickoff light-weight MFCS Program

Enabling Technologies

SFM

Automation

Ammo Marking

Inventory Control

Ammo Condition Indicators

ATR/ Discrimination Tech

IFF

MEMS Fuzing

Telemetry/Datalink

Rocket Assist Tech

Force-Level Models

Fire Control Algorithms

Summary

- Promoting a **modern organization and philosophy**
- **Transforming** cannon and mortar fire support munitions based on guidance, concepts, trends, and observations
- Fire support materiel transformation is characterized by improvements in **precision, accuracy, range, lethality, robustness, responsiveness,** and **scalability**
- Key precision products: **Excalibur, PGMM, CCF, MFCS, ACAAP, SFMs**
- Seeking improved **Enabling Technologies**

Questions?

Back-Up

Other Developments

Self-Destruct Fuzes

System Description: Submunition Fuze to reduce battlefield UXO

Requirements: UXO less than 1%

Goal: Lethality, Safety

IOC: FY04 **Status:** In Production

POC: Mr. Bill Vogt

System Description: Inductively settable Multi-Option Fuze for Artillery

Requirements: Compatible with bursting projectiles

Goal: Reduced Logistic Burden & HOB accuracy

IOC: FY04 **Status:** In Production

POC: Mr. Tony Barreiro

MOFA

Lt. Wt. Mortar

System Description: STO to reduce the weight of the M252 81mm Mortar System

Requirements: 30 to 50% lighter weapon system

Goal: Mobility, Portability

IOC: TBD

Status: Trade Studies

POC: Mr. Ed Lewis

System Description: Modular propellant

Requirements: Auto-Loading 155mm artillery ammunition

Goal: Increased Range, Reduced Costs

IOC: M231 – FY03, M232 – FY04

Status: In Production, Fielding

POC: Mr. Jim Rutkowski

MACS

Arms Room Concept

System Description: Provide Light Force maneuver commanders with 81mm and 120mm mortar support

Requirements: HQDA G3 approved BOIP change July 03

Goal: Lethality, Range, Flexibility

IOC: Fielding

Status: Seeking additional funding

POC: Mr. Ed Lewis

Less-Lethal Munitions

System Description: Designed for kinetic energy mitigation of Anti-Mate carrier to minimize collateral damage

Requirements: Lightweight with Parachute Delivery

Goal: Dispense Less-Lethal Payloads

IOC: TBD **Status:** Concept Studies

POC: Mr. Steve Hromnak

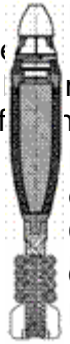
60mm Modernization

System Description: Mortar Anti-Personnel (MAPAM) rtridge with ball mentation

Requirements: Perform a side by side comparison of the MAPAM with the M720A1 Cartridge, analyzing Lethality and Effectiveness

Goal: Lethality **IOC:** TBD **Status:** SDD

POC: Mr. John Slivovsky



M864 Recap

System Description: "Like new" DPICM rounds with grenade Self Destruct Fuzes (SDFs) for the Stryker Brigade Combat Teams

Requirements: Submunition Self Destruct capability for 155mm artillery ammunition (<1% Dud)

Goal: Recapitalization, Safety

IOC: FY05

Status: Recap Feasibility Study Ongoing

POC: Mr. David Kondas

PM CAS Thrusts

Get PGM's & Smart Weapons to Warfighters

- Executing **Excalibur PGM** Advanced Development
- Transitioning **PGMM** to Advanced Development
- Managing the **Course-Correcting Fuze (CCF)** Technology Demonstration
- Fielding **Mortar Fire Control System Heavy (MFCS-H)** and Developing **MFCS-Light**
- Executing **Sensor-Fuzed Munition (SFM)** Compatibility Assessments

Satisfy Customers and Achieve Excellence

- Seeking funding for the **120mm Extended Range Mortar Program**
- Seeking funds for the **Mortar Arms Room Concept**
- Monitoring **Lightweight Mortar** and **Less-Lethal Munitions** Science & Technology Objectives (STOs)
- Working to Ease Transition of Science Technology Objectives into Advanced Development
- Developing Strategic Plan and Business Practice Guidelines and Harmonizing Business Practices with the Joint Munitions Command

Improve and Sustain Conventional Munitions

- To meet FCS Emerging Requirements for Munitions, Working with Proponents to Develop Capabilities such as the **NLOS-M**, the **Advanced Cannon Artillery Ammunition Program (ACA²P)** and **Course Correcting Fuzes**
- Fielding the **Modular Artillery Charge System (MACS)** to the active force
- Producing Bomblet **Self-Destruct Fuzes**
- Reengineering selected Munitions, such as the **60mm Mortar (HE)** and **155mm M864 (DPICM)**
- Reengineering Pyrotechnic, Explosives, and Propellants (PEP) for Improved Effectiveness, Safety, Insensitive and Environmental Compliance

Grow World Class People and Teams

- Emphasizing Improved Communications
- Disseminating the PM CAS Management Philosophy and Disciplined Processes to Partners in Industry and Government
- Reshaping and Reorganizing the Workforce
- Developing Individual and Team Training Strategies
- Launching Leadership Competency Training

The Road Ahead

- Leverage guidance, studies, concepts, experiments, operations, and trends
- Determine capability gaps and materiel needs
- Pursue integrated fires and effects Doctrine and TTP
- Develop integrated fire support systems strategy
- Obtain validated requirements
- Clarify army funding priorities
- Leverage enabling technologies
- Execute and protect the strategy

What is the Correct Objective Force Indirect Fire Balance?

Networked

- ***Sensors***
  - JSTARS - U2R - TENCAP - Multi-mode Radars - Air Defense Radars
  - Aerial Common Sensor - Space Based Sensors - A2C2S - Comanche - UAV
- ***Shooters***
  - ✓ NLOS Mortar
  - ✓ NLOS Cannon
  - ✓ HIMARS
  - ✓ Attack helicopters
  - ✓ Joint Air (CAS, AI, SOF)
  - ✓ NLOS-LS and TLAM-like missiles
  - ✓ Unmanned Combat Aerial Vehicles (UCAV)
- ***Munitions***
  - ✓ PGMM, Excalibur, LAM, PAM, ATACMS, Other Svc's Munitions, G-MLRS AFAM, MSTAR

- **Simulation**
- **Experimentation**
- **Analysis**

Fully Capable Force

"The department must have multiple joint and service-centric concept development efforts underway to ensure a robust competition of ideas." – *Transformation Planning Guidance (2nd Draft)*

Generalized Attributes of Indirect Fires Transformation

Army Indirect Fires provide increased flexibility and overmatch lethality to maneuver commanders in the Future Force by being:

- **Responsive** – Tactically responsive and fully integrated with maneuver.
- **Deployable** – Inter- and intra-theater using air and sea lift.
- **Agile** – Better manages battlefield transitions, such as retargeting and dynamic target attack
- **Versatile** – Provides greater mission breadth through scalable effects in all physical environments.
- **Lethal** – Achieves suppressive, protective, and destructive effects [through mass, precision, accuracy, and rates of fire].
- **Survivable** – Optimizes organic crew protection, maneuverability and tactical responsiveness.
- **Sustainable** – Reduces logistic demands through the integration of conventional and precision fires.

Ground Munitions Terminology

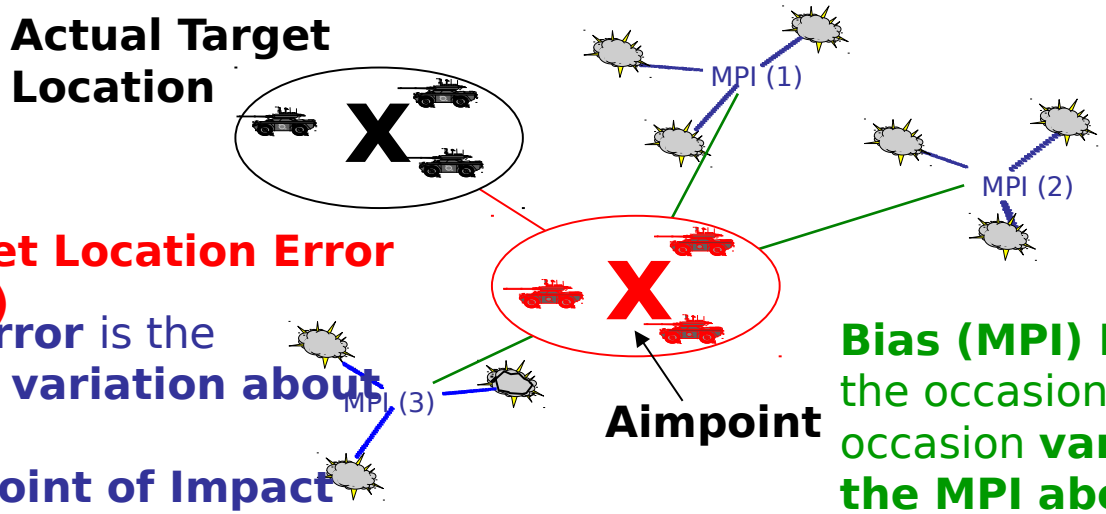
- **Area Fire Munitions (AFM)** – Achieves sufficient precision at short to medium ranges to suppress, neutralize or destroy dispersed area targets (M934 mortar, M107, M795, M864, M549, ACAAP)
- **Near Precision Munition (NPM)** – Achieves greater precision to suppress, neutralize or destroy area targets, using fewer munitions than for AFM fire missions, and at medium to long ranges (M864 w/ CCF, ACAAP w/ CCF)
- **Precision–Guided Munition (PGM)** – Maneuvers to engage an area or point target with sufficient accuracy to suppress, neutralize or destroy it. (Excalibur, ERGM, LRLAP, BTERM)
- **Terminally–Guided Munition (TGM)** – Locates, identifies and maneuvers to hit a point target with accuracy sufficient to result in a high probability of target destruction (PGMM, Copperhead)
- **Smart or Sensor Fuzed Munition (SFM)** – Detects target signature and hits the target to neutralize or destroy it (SADARM, SMArt155, Bonus)
- **Special Purpose Munitions (SPMs)** – Includes obscurants, illumination, mines, unmanned sensors, cargo, reconnaissance, HPM, thermobaric, and less-lethal munitions

Indirect Fires

- What?
  - Indirect fire support systems consist of mortars, cannons, rockets and missile launches, attack helicopters, UAVs and joint air/sea platforms
- Why?
  - **Suppressive and Protective Fires** – To facilitate the ground commander's ability to maneuver his forces
  - **Destructive and Protective Fires** – To enhance the ground commander's ability to conduct assaults and defenses
  - **Protective Fires** – To ensure and enhance ground force survivability
  - **Destructive Fires** – To reduce the enemy's warfighting capability, speed his defeat, and reduce the need for direct assault.

PM Combat Ammunition Systems

Precision Related Terminology



Target Location Error (TLE)

Precision Error is the uncorrelated **variation about the Mean Point of Impact (MPI)** for a given mission

Bias (MPI) Error is the occasion to occasion **variation in the MPI about the aimpoint**

- **Delivery Accuracy** – Ability to hit an aimpoint, includes both Precision and Bias errors. Often referred to as "Precision" for guided munitions when bias is insignificant.
- **System Accuracy** – Ability to hit the target for a given mission. Is a function of Delivery Accuracy and TLE.
- **Precision Fires** – The capability to destroy selected high-value and time-critical targets, or to inflict damage with precision, while limiting collateral damage.
- **Precision Engagement** – A system of systems that enables our forces to locate the objective (or target), provide responsive command and control, generate the desired effect, assess our level of success, and retain the flexibility to reengage with precision when required

Munitions for Point Targets

Point Target	Range Band			
Target Type	**1-7**	**7-21**	**21-30**	**30+**
Heavy Armor	TGM	TGM	TGM	TGM
	SFM	SFM	SFM	SFM
Light Armor	TGM	TGM	TGM	TGM
	SFM	SFM	SFM	SFM
		PGM	PGM	PGM
Trucks	TGM	TGM	TGM	TGM
		PGM NPM	PGM NPM	PGM
Crew Served Weapons	TGM	TGM	TGM PGM	TGM PGM
	AFM	PGM NPM	NPM	
Bunkers	TGM	TGM	TGM	TGM

Munitions for Area Targets

Area Target	Range Band			
Target Type	1-7	7-21	21-30	30+
Heavy Armor	TGM	SFM	SFM	SFM
	SFM			
Light Armor	TGM	SFM	SFM	SFM
	SFM	PGM	PGM	PGM
	AFM	NPM	NPM	PGM
		AFM	AFM	
Trucks		PGM	PGM	PGM
	AFM	NPM	NPM	
		AFM	AFM	
Crew Served Weapons	AFM	PGM	PGM	PGM
		NPM	NPM	NPM
		AFM	AFM	AFM

Munitions Mission Breadth

	Excalibur	PGMM	CCF HE	CCF DPICM	CCF SFM	CONV 155 HE	CONV 120 Mortar	Thermo	HPM	Other
Precision	✓	✓								
MOUT	✓	✓						✓	✓	
Protective	✓	✓	✓			✓	✓			
Destructive	✓	✓	✓	✓	✓	✓	✓			
Close SPT	✓	✓	✓				✓	✓		
Shaping	✓		✓		✓					
Suppressive			✓	✓		✓	✓	✓	✓	✓
Shielding			✓	✓		✓				✓
SPCL Purpose								✓	✓	✓